ANTARCTIC EXPLORATION.

(By Chas. P. Sprent, Deputy-Surveyor-General.)

During the last three years the subject of Antarctic Exploration has frequently been brought forward and discussed by the Scientific Societies of Europe, America, and Australia, and a general desire has been expressed to see a renewal of scientific investigations in those almost unknown regions. The North Polar regions have been so far explored that no new discoveries of any importance are to be looked for in that quarter; the theory of an open Polar Sea has been annihilated by the discoveries of Sir George Nares and Lieut. Greeley, and it is now clearly understood that the North Pole is surrounded by a frozen sea of ancient ice, the Palaocrystic Sea, over whose rugged surface travelling is so painfully slow that all hope of reaching the Pole by ordinary means of progression has been abandoned. For forty-three years no scientific expedition has visited the Antarctic Seas, and as during that period immense advances have been made in all branches of scientific enquiry, it is only natural that, with the hope of acquiring new facts, as well as of verifying recorded facts, the attention of the scientific world is being directed to the South Polar regions, where so little has been done in the way of exploration that, with the exception of a few detached pieces of coast-line, nothing whatever is known of an area of the globe fully as large as the Continent of Europe. Baron von Mueller, the President of the Victorian Branch of the Geographical Society of Australasia, referred to the subject in his annual address in 1884, and last year he dealt with it more fully. His remarks appear to have attracted some attention, for the Geographical Section of the British Association, under the presidency of Lord Abedare, have now taken up the subject and given it their powerful support. In September of last year the Association appointed a Committee, consisting of Sir Leopold McClintock, Sir George Nares, Sir Joseph Hooker, Dr. Carpenter, Mr. Clements Markham, and others, to bring up information.

Admiral Sir Erasmus Ommanney, who was appointed Secretary, read a paper before the Association setting forth the history of previous explorations, the results achieved, and the problems to be solved by future exploration. Unfortunately, no copy of this report is to be found in Hobart, but I notice that, as the project meets with much support both in England and on the Continent, it is probable that an Expedition will shortly be organised. I notice also that it is likely the British Association will visit Sydney next year; if

so, the project will probably be brought forward at that meeting, and some definite plan arranged.

It has been suggested that before any costly large Expedition is despatched, it would be advisable to send out a pioneer vessel to examine certain unknown parts, to select suitable places for winter quarters, and make preliminary observations. The Geographical Society of Australasia and the Royal Society of Victoria are anxious that this preliminary Expedition should be undertaken by Australia, and have invited the co-operation of the various Governments and learned Societies of these colonies, hence the communication which we have arranged to discuss this evening. There are about half a dozen members of the Geographical Society of Australasia residing in Tasmania, and as one of them I have been requested on behalf of that Society to place the subject before you. I have, therefore, compiled some information from the best available authorities, in the hope that the Fellows of this Society, and the public of Tasmania generally, may be induced to take an interest in the matter, and assist in securing the proper representation of Australia in any new exploration of these Southern Seas. And I appeal to the sympathy of this Society all the more confidently because there are some of you—Mr. Barnard, our chairman, is one—who, as members of the Tasmanian Society, the parent of our Society, enjoyed the personal friendship of those heroes of Polar discovery, Sir John Franklin, Sir James Ross, and Captain Crozier, and heard them narrate their now world-renowned adventures.

In compiling this paper I have availed myself of Sir James Ross's Voyages, Wilkes's Voyages, Dr. Neumayer's papers in the 7th Volume of Nature, papers by Sir Wyvill Thompson and Mr. Moseley, of the Challenger staff, addresses delivered in Melbourne by Baron von Mueller, Mr. G. S. Griffiths, Mr. Macdonald, and others, as well as the articles upon the subject in the 19th volume of the Encyclopædia Brittanica. With this acknowledgment, I plead guilty to having frequently adopted the very language of my authorities.

To understand what has already been done, a brief history of Antarctic discovery is necessary; and before entering upon that narrative it may be mentioned that as far back as the 16th century geographers argued the existence of a large southern continent, necessary in their opinion to balance the weight of land in the Northern Hemisphere; and just as there are to be found vague accounts of prehistoric discoveries in the Arctic regions, so we may discover similar accounts of supposed discoveries in Southern Seas.

In January, 1600, one Dirk Gerritz, a Dutchman, on a voyage from the East Indies, falling in with tempestuous

weather off Cape Horn, was driven so far south that he reached some ice-bound islands, where he saw immense numbers of whales and seals. His story was not believed at the time, but it is now generally conceded that he actually did cross the Antarctic Circle.

When New Holland was first discovered it was supposed to form part of the Antarctic Continent, and was so delineated upon the maps until 1642, when Tasman proved it to be an island. The area of the supposed continent having been thus reduced, it was delineated as extending as far north as Kerguelen. In 1773, Cook, sailing on a westerly line, passed far to the south of Kerguelen; and in 1775 he penetrated to 71° S., exploring between 175° and 98° W. longitude. Cook made a complete circuit of the Southern Ocean, several times crossing the Antarctic Circle, thus proving that if any continent existed it must be looked for inside the circle. It is worthy of note, as exemplifying the difference in seasons, that Cook reached his highest point, his "ne plus ultra," as he called it, without entering the ice. We shall see that subsequent explorers passed through hundreds of miles of ice before reaching the same latitude.

In the beginning of the 18th century American whale and seal fishermen, operating in the vicinity of the Falkland Islands, sailing south, re-discovered the islands reported by Gerritz.

In 1819 an expedition was sent out by Russia, under Bellinghausen, with the avowed intention of reaching the South Pole. They sailed south on the meridian of Greenwich, and reached lat. 69° 25′ S.; subsequently they reached 69° 31′, and then gave up the attempt, having failed to reach as high a latitude as Cook. They discovered Peter the First Island and Alexander Land.

In 1823 Captain Weddell, of Leith, with two small vessels —one of 160 tons, the other of 60 tons—sailed from the South Shetlands on a whaling voyage, and, finding the sea open, penetrated to 74° 15′—a remarkable performance for such small vessels, and one that has never since been equalled in that portion of the Southern Seas. Weddell, besides being a daring navigator, seems to have been a skilful fisherman, for during the few seasons he was in South Georgia he obtained 20,000 tons of sea elephant oil and several cargoes of fur sealskins, which he afterwards took to China and sold at a dollar a skin. Weddell's performance eclipsed Cook's, and is second only to Ross's.

In 1830 the Messrs. Enderby, of London, despatched Captain Biscoe on a whaling voyage to the Southern Seas, when he discovered Enderby's Land, Adelaide Island, and Graham's Land. In 1839 the Enderbys sent out Captain Balleny with

the brig Eliza Scott and the cutter Sabrina. This voyage led to the discovery of Balleny Islands and Sabrina Land. These discoveries did not attract much notice at the time, they came more prominently before the public a few years later, when Wilkes and D'Urville disputed as to the honor of having discovered the long sought for Antarctic Continent. Undoubtedly these whaling captains are entitled to whatever honor there is to be gained from first discoveries in that quarter.

From 1839 to 1843 the exploration of the Antarctic was vigorously prosecuted by American, French, and English naval expeditions as well as by a few American and English whalers. The French Expedition, commanded by Dumont D'Urville, took up the exploration of the region round the South Shetland Islands. They discovered Joinville Island and Louis Phillippe Land, although Weddell seems to have been aware of their existence. In 1840 D'Urville visited Hobart with the corvettes Astrolabe and Zelée; he refitted his ships here, and then sailed south again; on this occasion he discovered Adelie Land and Clarie Land. It would appear that French seamen are not physically fit for prolonged exertion in high latitudes, for D'Urville's crews suffered so severely from scurvy and sickness that he was compelled to shorten his cruise.

The American Expedition was under the command of Captain Charles Wilkes, it consisted of two sloops, one brig, and a schooner; the Antarctic cruise was merely a short portion of a programme extending over several years' sailing.

They made their first acquaintance with Antarctic work in the vicinity of the South Shetlands, but they did not make any new discoveries of importance, and failed to reach Weddell's latitude. They made their way to Sydney, where they refitted, and then sailed south on the meridian of 170°. On the 11th January, 1840, they found their further progress south cut off by a perpendicular barrier of ice; they were of the opinion that they could see land in the distance over and beyond the ice. Wilkes claims that he discovered the Antarctic Continent on the 16th January, in long. 157° 46′. Whether he did or not is hard to say; he appears to have been rather too sanguine and too ready to accept appearances. He obtained no bottom at 850 fathoms, so that one is inclined to think that he was wrong here, as he was proved to be wrong in other places. On the 20th January, in longitude 140deg. 2min. 31sec. E. and lat. 66deg. 45min. S., they undoubtedly did discover land. Wilkes says—"We approached within half a mile of the dark volcanic rocks which appeared on both sides of us, and saw the land gradually rising beyond the ice to the height of 3,000 feet, and entirely covered with snow. It could be distinctly seen extending to

the east and west of our position fully sixty miles; and now, when all were convinced of its existence, I gave the land the name of the Antarctic Continent. Some of the officers pointed out the appearance of smoke, as if from a volcano, but I was of the opinion that this was nothing but the snow drifts caused by the heavy squalls."

They followed along the barrier ice as far as long. 100deg. E., having land in view all the way; but finding themselves unable to set foot on anything but ice, and being unable to get any further south, they rerurned to Sydney.

The English Expedition sailed in August, 1839, consisting of the Erebus, under Captain Ross, and the Terror, under Commander Crozier, both well-trained and experienced ice navigators. Ross gained his laurels under Parry, whose highest north was not eclipsed until Nares' Expedition in the Alert and Discovery. He was also remarkable in Arctic exploration as the discoverer of the North Magnetic Pole. After some unimportant explorations, Ross brought his ships to Hobart, where he established an Observatory, and left an officer to make systematic observations. Before leaving England Ross had given the Americans the benefit of his counsels in equipping their expedition, and had openly announced to the world where his own ships would operate, he was, therefore, not a little piqued on his arrival in Hobart to learn that D'Urville and Wilkes had both selected the same ground. Disdaining to follow anyone's tracks, Ross selected the meridian of 170°, intending to work to the eastward of that line, and on that meridian he crossed the Antarctic Circle on New Year's Day, 1841. As the Erebus and Terror had both been specially strengthened to encounter ice, their commanders sailed them right into the pack ice, battling their way for 200 miles through its broken fragments, until they emerged upon the open sea in lat. 69deg. 15min. S., and long. 176deg. 15min. W. On the 11th January land was discovered, and on the night of that date a landing was effected upon an island, where they planted the British flag, and drank the healths of the Queen and the Prince Consort. This place they called Possession Island; it and Franklin Island are the only two places in that part of the Antarctic where a landing has been effected. Wilkes, as we have seen, never landed at all, and D'Urville only succeeded in setting foot upon a small rock. Having the mainland in sight they followed the coast line for 10deg. of latitude, naming the country S. Victoria Land. On reaching 78deg. S. they discovered a volcano upwards of 12,000 feet high in active eruption; this they named Mt. Erebus, a quiescent peak close by being named Mt. Terror. They saw Mt. Erebus belching out fire and smoke, and the lava running down its

snow-clad peak. In latitude 78¼ they found their further progress south stopped by a barrier of ice, presenting a perpendicular cliff to the sea, from 150 to 200 feet high. After sailing along this barrier for some distance, they found the sea beginning to freeze, so they retraced their course along Victoria Land until Ross was able definitely to fix the position of the South Magnetic Pole; but owing to the impossibility of scaling the ice barrier and traversing the land, they did not attempt to reach the exact spot. Ross thus achieved the remarkable distinction of being the discoverer of both the magnetic poles of the earth; he had actually stood upon the spot of the North Magnetic Pole.

One incident of this trip led to much acrimonious discussion. Wilkes had presented Ross with a chart of his discoveries, showing a shore line backed with mountains extending from 97 to 107 E. long. Ross sailed right over the spot where Wilkes showed a mountain, and as the weather was perfectly clear at the time, Ross says he should have seen any high land within a radius of 70 miles. He hove his lead in 600 fathoms where a mountain had been reported. The Erebus and Terror returned to Hobart from this voyage.

On their second voyage they visited New Zealand and the islands to the south. They encountered the first icebergs in lat. 58deg. 36min., and entered the ice-pack in lat. 60deg. 50min. On this occasion they encountered much more pack ice than on their first voyage; and it is somewhat remarkable that whereas Cook reached his highest point without entering the ice, Ross and Crozier passed through 800 miles of it before reaching the same parallel. They reached 78deg. S. somewhat to the east of their former position; they traced the barrier along for some distance to the eastward, and although they saw appearances of land, they made no important discoveries. They retreated along the edge of the pack, and then bore away for the Falkland Islands, where they wintered.

In 1843 they explored the islands near the S. Shetlands, discovering new land in several places. They reached 71deg. 30min. S., beating Bellinghausen, but failing to equal Weddell, who reached 74deg. They found it impossible to make a way through the pack ice without running great risk of being frozen in; they therefore made their way up to the Cape of Good Hope, and then back to England.

This may be said to close the history of Antarctic discovery, for although the Challenger steamed south from Kerguelen, she only went as far as 66deg. 40min., where they searched for Wilkes' Termination Land without finding it; she sounded

in 1,300 fathoms of water within six miles of where it was stated to exist.

Having now sketched out the history of Antarctic discovery, we may proceed to notioe the results achieved, and from an examination of the facts recorded, endeavour to form some conclusion as to the physical geography of this interesting region. Glancing at the maps of the Arctic and Antarctic regions, the first thing that strikes us is that the physical features are exactly opposite. In the Northern Polar regions there is a large preponderance of land; in the South the land masses are small in comparison with the vast extent of ocean. In the North the land masses are so close to the great continents that men, animals, and plants have distributed themselves over all the habitable regions; in the south the patches of land known to exist are isolated from temperate regions by a wide belt of stormy sea, and except in the direction of South America there is no appproach to the other land divisions of the globe. To this circumstance we may ascribe the want of interest shown in Antarctic discovery. For some three hundred years the Arctic Seas were explored in the hope of finding a North-west Passage to China and India, and for many years expeditions were employed in searching for tidings of the fate of Franklin and his companions. The number of purely scientific expeditions was small indeed until within the last ten years.

It will be seen that outside of the Antarctic Circle the land consists of a few small islands, mere dots in the ocean. Inside the Antarctic Circle the land masses are so imperfectly known that we are unable to say whether there is a continent or merely a series of detached groups of islands. The balance of evidence is in favour of the supposition that the Antarctic lands are groups of islands connected together with a continuous ice sheet. The greater part of the land hitherto examined is comparatively low, rarely rising above 2,000 feet in altitude, including the ice cap, the exceptions to this rule being the great mountain chain extending from Balleny Island down Victoria Land to Mt. Erebus, including several peaks rising above 14,000 feet in elevation. Other mountain masses are to be found on Peter the Great Island, Adelaide Island, and Louis Phillipe Island.

With the exception of a few points swept bare by currents, all the land appears to be fringed with an ice barrier, varying from 70 to 200 feet in height. D'Urville, Wilkes, and Ross all agree in describing this barrier, none of them were able to scale it, consequently none of these explorers set foot upon the main land. Far away beyond the barrier, in the misty distance, vague forms of hills have been reported, but the appearances are so often deceptions that inexperienced

explorers are apt to be misled in the way Wilkes was. The barrier is so unlike anything that occurs in the Arctic regions and is so remarkable a feature in the Antarctic, that a few minutes may be devoted to explaining its formation. The late Sir Wyvill Thompson, in a lecture delivered by him at Glasgow, gives a very interesting account of the peculiarities of Antarctic ice, and to him I am largely indebted for what follows:—

Some idea of the formation of the barrier may be gathered from an examination of the icebergs found floating northwards, often as low as 42deg., in the track of vessels making the Australian voyage. All observers agree in describing these bergs as being fundamentally of a tabular form, composed of layers of ice in regular strata of varying degrees of density. It is true that as these bergs reach warmer waters their original forms become obscure, and they melt into all sorts of irregular shapes, but they always retain their original lines of stratification. They are entirely different to the Arctic bergs, which are always of irregular or fantastic shapes, and entirely devoid of stratification; this difference is to be ascribed to the different circumstances attending their formation and not to difference of weathering. As a general rule, the Arctic Coast line, except in winter, is bare or only fringed with broken ice. Deep indentations resembling those on the Norwegian Coast, are numerous, and invariably, at the head of these indentations, glaciers push their way into the sea. It is these glaciers or ice rivers that furnish the Arctic bergs. The general ice sheet is comparatively thin; on the coast of Greenland, as far north as Peterman Inlet, it is not more than 40 feet thick. The Antarctic bergs are masses broken off from the great barrier; they are often of immense size, several have been noticed over four miles long. The stratification is due to the fact that they are formed by successive layers of snow falling upon flat land. The water in front of the land being shallow, and the land itself presenting but a slight slope, the ice moves slowly forward, pushing its way into the sea until it reaches water so deep that the lower stratum of ice no longer rests upon the bottom; part of the mass then breaks off and floats away before the prevailing winds. Whilst this is going on the surface is constantly receiving fresh deposits of snow; these partially melt, and then freeze again into ice. When the bergs first float away their lines of stratification are parallel to the surface of the sea; as their bases melt their centres of gravity becoming changed, they roll over, exposing fresh surfaces, and tilting up the strata at various angles. Caves are worn into the perishing ice, and the superincumbent strata often bend, exhibiting those foldings and contortions we are

familiar with in stratified rocks. Sir Wyvil Thompson describes the bergs seen by him as being of a beautiful blue colour, gradually deepening in tint towards the base, and states that all were of the tabular form, and that they did not see one single berg whose appearance indicated that it had been formed by passing down a valley or over uneven ground, nor were any seen carrying rocks, stones, or gravel. As Antarctic bergs are often met with upwards of 150 feet high above the water line, and as from their specific gravity they must have at least eight times as much depth below water, it follows that they have a total thickness of at least 1,400 feet. The bergs are met with as low as 42deg. S., and the Hon. Audley Coote informs me that he has encountered several in about that latitude within a few hundred miles of the Tasmanian coast. Wilkes says that in the year 1832 bergs were so numerous about Cape Horn that vessels were compelled to return to Valparaiso. The largest berg measured was 210 feet above the water line.

The pack ice of the Antarctic seems to be much more broken than that of the Arctic. Ross says that they rarely saw a piece more than a quarter of a mile in circumference, whereas in the Arctic seas pieces four miles in diameter were met with, and at times the pack consolidated into "fields," covering the sea as far as could be seen from the ship. This difference is ascribed to the fact that the Antarctic seas are rougher than the Arctic.

In the Arctic regions the large extent of the land masses, and the influence of warm currents produced by the dispersion of the Gulf Stream exert an ameliorating influence upon the climate tending to break up the ice. In the south no such influences exist, and therefore the summer climate is colder than the northern climate in corresponding parallels. As to the winter climate we can only form conjectures, as no one has yet wintered within the Arctic circle. Maury, who had ample opportunities of forming opinions as to the climates of both regions, thinks that the mean temperature is higher in the south than in the north, and there is some evidence to support his theory. A self-registering thermometer was left on the South Shetland in latitude 63deg., and after remaining there for several years it was examined and found to register a minimum of 37deg. F. below freezing point; the mean winter temperature of several localities in the same latitude north is 68deg. F. below freezing. It would appear that various points in the outline of the ice are influenced by warm currents, for although so much of the great equatorial current as is deflected south is, to a great extent, swallowed up in the vast expanse of ocean, yet some portions escape, and their influence can be traced.

In the summer time the ice pack is in a broken up condition, and there are deep notches in its general outline, apparently due to the currents which flow down the American Coast and the Coast of New Zealand; it is in these directions that explorers have reached their highest latitudes. How far the Antarctic climate may be influenced by volcanic heat we are unable to say. Rain is not frequent, but snow falls on an average every other day.

Very little is known of the geology of the Antarctic regions, only a few outlying islands have been examined, and these are all volcanic. Specimens of rocks have been obtained by dredging the sea bottom, a few have been gathered from floating ice, and some from the stomachs of seals and penguins; Dr. McCormack, of the Erebus, says the penguins were his best collectors, some of them having as much as 10lbs. of stones in their stomachs. It has been already mentioned that no icebergs are met with carrying stones on their upper surface, but it is evident that the ice sheet moving slowly over the surface of the land must detach rocks with its lower stratum, and accumulate mud from the grinding of the surface over which it passes. These materials are dropped as the bergs meet in warmer waters, hence it is found that the sea bottom is strewn with the remains of the Antarctic land. All the specimens procured from the sea bottom in the vicinity of S. Victoria Land and the South Shetlands are precisely such as would be furnished by the West Coast of Tasmania, they comprise greenstone, basalt, granite, mica slate, chlorite slate, hornblende slate, and clay slate. One cannot help speculating whether any valuable minerals exist under that great ice sheet, a "rush" to the Frozen South would be something novel, although a precedent can be found; as far back as Queen Elizabeth's time a number of English gentlemen sailed under Martin Frobisher to look for gold in the Frozen North,—it is needless to say they were disappointed. Dr. McCormack says that the Islands south of Cape Horn are all volcanic. The only specimens procured were basalt, greenstone, granite, vesicular lava, scoriæ, and pumice, the greenstone is frequently columnar, indeed some of the capes are exactly similar to Cape Pillar. It is somewhat remarkable that no specimens of recent stratified rocks have been obtained, nor can I hear of any fossils having been found. Although volcanic rocks are largely developed in the Arctic regions we find there a considerable thickness of Palæozoic rocks and Tertiary deposits, the former containing coal seams and the latter extensive leaf deposits. We are accustomed to associate coal plants with a moist steamy atmosphere, so that at one time the climate of Greenland must have been sub-tropical. The Tertiary Leaf Beds contain abundant remains of the oak, syca-

more, poplar, elm, magnolia, sequoia sassafras viburnum, and other trees of temperate zones. We are here confronted with one of the most interesting problems of geology. How did those plants contrive to flourish in a region where no trees can now exist, and where there is for many months a total absence of sunlight. Is it possible that the ice which now covers the two poles is a mere accidental occurrence in time. It would seem that at one time the North Pole at all events enjoyed light, sunshine, and warmth. We know that the ice which now is confined to the Polar regions at one time extended as far south as the middle of France, and that there came a warm interval when the lion, rhinoceros, elephant, crocodile, and other tropical animals spread themselves over Europe as far north as Scotland, and that the cold returning these animals were destroyed or driven south again. I am well aware that certain physicists explain these matters some by referring to the precession of the equinoxes and others by supposing a change in the axis of rotation; but the changes due to the former cause will not account for the presence of coal plants in Northern Greenland, and the most eminent mathematicians reject the possibility of the latter. Sir William Thomson says that the axis of the earth cannot have been changed without "such enormous transposition of matter on the earth's surface or else such distortions of the whole solid mass as would present far greater difficulties of another kind than those with which we have had to deal." Whilst all these changes were going on in the Northern Hemisphere what was the state of things in the Southern? Is there any evidence of a Glacial Period in Australia? I observe that this question is being discussed in our contemporary Societies. Some light may be thrown on this problem when we become better acquainted with the geology of the Antarctic.

Again what is the present state of the volcanic forces of the Antarctic? Ross saw Mt. Erebus in active eruption, some of the officers of the Terror thought they saw smoke issuing from the lofty peaks of Louis Phillipe Island, some of the American officers were of opinion that they saw volcanoes, and one American whaling captain reported that on visiting Deception Island, one of the S. Shetlands, he found 13 craters in active eruption. An active crater is supposed to exist on Kerguelen, and we have had recent experience of the New Zealand volcanoes. Remembering that Iceland is the theatre of vast volcanic forces and that Jan Mayen is still active within the Arctic Circle some theorists have been led to suppose that the earth's crust thins out at the Poles.

Geologists will look forward with great interest to the prospect of further exploration in the Antarctic.

It is not my intention to describe the Flora and Fauna of

the South Polar regions. I confine myself to dealing with some points arising from a comparison of the life found in those scattered lands : Mr. Griffiths, of Melbourne, gives some interesting information, based on the observations of Darwin, Wallace, Hutton, Sir Joseph Hooker, and others. Thus 44 per cent. of the New Zealand flora is of Antarctic origin ; whilst the Auckland, Campbell, and Macquarie Islands all support Antarctic plants, some of which have never reached New Zealand. The flora and fauna of Kergulen, the Crozets, and Marion Island are almost identical. Tristan d'Acunha has 58 species of marine molluscs, of which 13 are also fonnd in S. America, 6 or 7 in New Zealand, and 4 in South Africa. Temperate S. America has 74 genera of plants in common with New Zealand and 11 of its species are identical.

Dr. Hooker, writing of the botany of Tierra del Fuego, says:—"The Fuegian flora possesses some other points of interest when viewed in comparison with that of the Antarctic Islands lying to the south of New Zealand, also with that of the Falkland Islands, S. Georgia, Tristan d'Acunha, and Kerguelen Island. All these countries, though the latter is distant some 5,000 miles, seem to have borrowed many plants from this, the great botanical centre of the Antarctic Ocean. And it is a still more surprising fact that the vegetation of Fuegia includes a considerable number of English plants, although 106 degrees of ocean roll between, and some of the species in question inhabit no intermediate latitudes." The inference drawn from these remarkable facts is that at one time a large extent of land existed in the Southern Ocean, that it has subsided beneath the ocean, leaving only isolated peaks as evidence of its former existence. The investigations of the Challenger staff show that Kerguelen, its adjacent islands, the Crozets, Marion, and other islands stand on one common submerged plateau rising to within 1,500 fathoms of the surface. These considerations, in view of the recent discoveries of leaf remains in our Tertiary Beds of species related to oaks, laurels, elms, &c., might furnish our friend Mr. Johnston with material for a paper on our fossil flora and its relations to exotic plants.

Seeing that no one has set foot on the Antarctic Continent, we are not quite sure whether any land animals exist there or not; none have been seen, nor have any land birds, although sea birds are numerous—in fact, the islands lying between 50deg. and 60deg. seem to be the chief breeding places of the albatros. Penguins are very numerous—that is, the common variety ; but there is one species which attains a weight of 75lb. and upwards, which seem scarce.

Whales are abundant, especially within the Antarctic Circle. Ross, Wilkes, D'Urville, and Nares all report having

seen them in great numbers and of very large size. They are of the variety known as black whales, finners, and humpbacks. Sperm whales are reported by Wilkes, but probably he was mistaken, as they do not frequent cold waters. When the whale fisheries were at the height of their prosperity over 100 vessels were engaged, and it is reported that the Samuel Enderby took to England a cargo valued at £40,000.

Three varieties of seals are abundant. The largest one reported was 12 feet long, 6 feet in circumference, and weighed 850lb., yielding 16 gallons of oil. Fur seals are not found in the regions south of New Zealand, and only in limited numbers amongst the S. Shetlands, Kerguelen, and Heard Islands; and, from the accounts of the officers of the Challenger, it would seem that they are being recklessly exterminated by American whalers.

Seeing that parts of S. Victoria Land are bare, and that the climate of Wilkes Land cannot be worse than that of Greenland about Disco, where animals and plants contrive to flourish, it is not unlikely that the main land of the Antarctic Continent may furnish some new contribution to natural history whenever any one is able to effect a landing.

It now remains for me to answer the two questions that must inevitably be asked when any proposals for further exploration in the Antarctic are put before the people of these Colonies. (1.) What is the good to be expected from it? (2.) Why not leave it to others to try? In answer to the first question, we may reply, that independently of any commercial advantages that may result, we must look to the scientific knowledge to be acquired; and it is now generally conceded that the value of scientific investigations is not to be measured by mere pecuniary results. There is a numerous body of scientific men whose business it is to acquire information, to collect facts in various lines of enquiry, and to establish principles. No one can tell what the ultimate results of any particular scientific investigation may be, what practical advantages may accrue from pursuits which at one time seem purely theoretical. The advantages derived by the world at large from the application to every day use of steam, electricity, magnetism, heat, sound, &c., followed after long investigation of principles. Surgery, medicine, chemistry, hygieny, are all benefitting by the labours of men who were looked upon in their day as enthusiastic theorists. Literature, arts and sciences are not cultivated solely for money profit. In this Society we have a zealous band of workers energetically striving to increase our knowledge of the geology, botany, and natural history of the island we live in. Their labours do not add to the value of our exports nor add to the pecuniary wealth of the people, but they are

none the less valuable, and we look with pride on our little volume of Transactions as our modest contribution to the ever accumulating stores of scientific knowledge.

The programme for the proposed Antarctic voyage, as sketched out by our Victorian *confréres*, presents a varied and numerous array of subjects for investigation—subjects on which additional information will be welcomed by the scientific men of all countries. The commercial advantages, too, are sufficiently promising to have induced the Victorian Premier to lend his powerful support to the movement; and I notice that the Premier of Queensland approves of the project, although he doubts if the time is opportune; and seeing that the Geographical Societies of England, Germany, Italy, and Denmark are all anxious to see the work undertaken, I think we may rest assured that some good results will follow, and that we shall be in good company if we join in the work.

Lastly, it is incumbent upon Australia to take part in this exploration. We aspire to be the leading power in these Southern Seas, we are gradually setting up a Monroe doctrine of our own, and we are working ourselves into a perfectly hysterical condition at the bare thought of Frenchmen or Germans poaching upon what we consider our preserves.

All this may be very good policy if we can persuade other nations to see things as we do; but we must make up our minds to act as well as talk, and that it is useless for us to expect the whole force of the British Empire to be exerted in favour of our schemes unless we can prove that our aim is calculated to promote the welfare of the Empire as well as our own. If we expect to be the ruling power in these seas, the sooner we show ourselves upon them the sooner we shall see our claims recognised, and it is only by fostering a spirit of adventure and enterprise that a maritime power can be built up. The great commercial Empire of Great Britain was founded by adventurers who, in the days of Queen Elizabeth, made their way into newly discovered lands, establishing themselves in the most promising regions and defying all efforts to dislodge them. If we wish to build up a maritime power we must follow their example; and if we wish to preserve the islands of the Pacific for our commerce we must turn our attention to forming an Australian Navy and show the Mother Country that we are able to hold what we may acquire. Australia has already shown the Mother Country that she is prepared to share the dangers as well as the benefits of our connection; let us now show her that we are ready to send an Australian Contingent to share her work of science. If we do we may be certain that in this

SOUTH POLAR CHART

SHOWING HEIGHTS OF LAND AND DEPTHS OF SEA

ON LAMBERTS EQUAL AREA PROJECTION

Extracted from the Scottish Geographical Magazine

1886

NOTE

Ocean Soundings in Fathoms	·2500
Soundings, no bottom reached	300
Heights in English Feet	1500
Extreme Limit of Drift Ice	
Average Limit of Drift Ice	
Limits of Pack Ice	
Points reached by Explorers & dates	+ Cook 1773

line there is more lasting honour to be gained than in fighting the battles of the Old Country against half-armed savages. No time is more opportune for such a demonstration than the present, when the Colonies are so prominently before the public of the world. We have shown the rapid progress of our commerce and the vastness of our resources. We have proved that in manly sports we can hold our own with all comers; now let us show that the old Anglo-Saxon love of adventure is strong within us, and that although during our infancy we were content to share the benefits of scientific work, in our manhood we are ready to share the toil.

The scientific world is anxious to see a renewal of Antarctic exploration, and nothing would be more gratifying to them, nothing will be more calculated to give the world an earnest of our desire to help, than for Australia to take up this work. Certain it is that it would be a standing disgrace to Australia if she took no part in the exploration of the seas that wash her own coasts. And if Australia determines to undertake this work, I trust that this time Tasmania will act with them.

REMARKS REGARDING COAL SEAM OPENED OUT BY MR. BROCK AT COMPTON, OLD BEACH.

By R. M. Johnston, F.L.S.

Mr. Brock has recently sunk a shaft to a seam of coal, which he discovered indications of at sea margin a little north of Mount Direction.

The seam, about two feet thick, exists under hard laminated blue and grey shales containing abundant impresssions of the following Mesozoic fossil plants :—

Thinnfeldia	obtusifolia	*R. M. Johnston*
Phyllotheca	Hookeri	*M'Coy*
"	Australis	
Pterophyllum	Risdonensis	*R. M. Johnston*
Zeugophyllites	elongatus	*Morris*, very abundant

The shaft is sunk on the southern slope of the rounded hill, capped with variegated sandstones, opposite Austin's Ferry, which rises to a height of about 300 feet. The sandstones, evidently, at one time had spread over the coal seam with associated shales, and all seem to dip slightly in a westerly direction—that is, towards the Mesozoic rocks of a similar character situated on the western shore of the Derwent. Towards the east, the sandstones either abut against or are overlain by greenstones, forming the eastern slope of the same isolated ridge. Beds of a similar character ex-